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The U. S. Department of Energy
Ohio Field Office
West Valley Demonstration Project



**Safety Evaluation Report
for
Waste Processing and Support Activities
and the
Remote Handled Waste Facility,
WVDP-SER-001, Revision 3**

November 2005

As Related to:

Safety Analysis Report for
Waste Processing and Support Activities,
WVNS-SAR-001, Revision 10, Draft B

and

Safety Analysis Report for the
Remote Handled Waste Facility,
WVNS-SAR-023, Revision 2, Draft B

West Valley Demonstration Project
Contractor: West Valley Nuclear Services Company
Contract Number: DE-AC07-81NE44139

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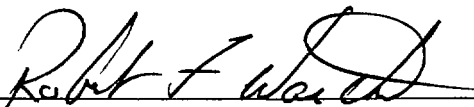
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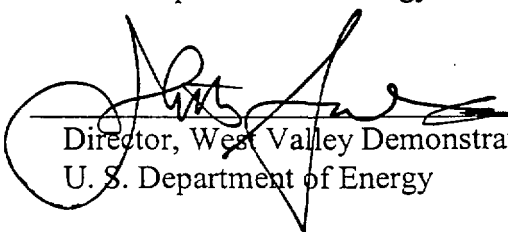
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Waste Processing and Support Activities,
WVNS-SAR-001, Revision 10, Draft B

and

Safety Analysis Report for the
Remote Handled Waste Facility,
WVNS-SAR-023, Revision 2, Draft B

APPROVAL SIGNATURES

R. F. Warther:  Date: 12/6/05
Manager, Ohio Field Office
U. S. Department of Energy

J. H. Swailes:  Date: 11/18/05
Director, West Valley Demonstration Project
U. S. Department of Energy

PREPARED BY

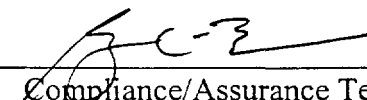
B. C. Bower:  Date: November 18, 2005
Compliance/Assurance Team, West Valley Demonstration Project
U. S. Department of Energy

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EXECUTIVE SUMMARY

This Safety Evaluation Report (SER) serves as the Department of Energy (DOE) approval document under 10 CFR 830, Subpart B, “Safety Basis Requirements” for WVNS-SAR-001, Rev. 10, Draft B, “Safety Analysis Report for Waste Processing and Support Activities” and WVNS-SAR-023, Rev. 2, Draft B, “Safety Analysis Report for the Remote Handled Waste Facility” at the West Valley Demonstration Project (WVDP). A listing of facilities and hazard categorization of the facilities encompassed in the SER is provided in Section 1.3.

The conclusion of this SER is that WVNS-SAR-001, WVNS-SAR-023 and WVDP-146, “West Valley Demonstration Project Technical Safety Requirements,” are adequate.

WVNS-SAR-001

WVNS-SAR-001, Rev. 10 is an annual update. However, WVNS-SAR-001 contains changes that recognize the substantially reduced hazards and accident-related risk at WVDP. The main drivers for the risk reduction include substantial decontamination activities in the Main Plant Process Building and the Vitrification Facility. This annual revision to WVNS-SAR-001 establishes the WVDP as Hazard Category 3, and contains changes that reflect this designation of the WVDP. With this revision of WVNS-SAR-001, there are no longer any Hazard Category 2 facilities at the WVDP.

Downgrading of several WVDP facilities from Hazard Category (HC) 2 to HC3 justified the deletion of a significant amount of outdated and less pertinent information based on application of the graded approach to SAR development. For example, information provided in Chapter 3 was dramatically reduced based on implementation of guidance provided in DOE-STD-3009-94 for the description of site characteristics for a Hazard Category 3 facility.

This routine annual update addresses the following Conditions of Approval given in Section 7.0 of WVDP-SER-001, Rev. 2, as follows:

- WVNS-SAR-001 shall be updated to also reflect a comparison to a non-frequency dependent Evaluation Guideline in accordance with guidance provided in Appendix A of DOE-STD-3009.
- WVNS-SAR-001 shall use a 100 meter distance when performing consequence evaluations to on-site receptors.
- WVNS-SAR-001 shall recognize TRU waste containers for TRU waste containing greater than one (1) gram fissile material as a TSR Design Feature. Passive features and performance requirements described in Section 6.2 of this SER shall be used as the derivational basis for this control, until such time that the SAR is updated. The SAR shall update Chapters 7, 9 and 11 to reflect this Design Feature, and such changes shall be made no later than the next annual update of the SAR.

- WVNS-SAR-001 shall recognize an additional administrative control that requires TRU wastes containing greater than one (1) gram of fissile material to be stored in approved non-combustible containers.

WVNS-SAR-023

The scope of WVNS-SAR-023 is the operation of the RHWF and operations outside the RHWF on the WVDP premises that involve transfer of wastes directly to and from the RHWF. The primary purposes of the RHWF are to cut up solid radioactive wastes, analyze, and repackage into appropriate (standard) types of waste containers. Limited decontamination of select waste items may be performed.

WVNS-SAR-023, Rev. 2, is an annual update from WVNS-SAR-023, Rev. 1. The annual revision incorporated "Conditions of Approval" given in WVDP-SER-001, Rev. 2, as follows:

- WVNS-SAR-023 shall be updated to also reflect a comparison to a non-frequency dependent Evaluation Guideline in accordance with guidance provided in Appendix A of DOE-STD-3009. These updates shall be accomplished no later than the next annual update of both SARs.
- WVNS-SAR-023 shall use a 100 meter distance when performing consequence evaluations to on-site receptors. Since the Review Team concluded that overall results of the current hazard and accident analysis do not change, these updates shall be accomplished no later than the next annual update of both SARs.
- WVNS-SAR-023 shall recognize the RHWF work cell structure as a TSR Design Feature. The material of construction and dimensions of the Work Cell walls, roof and floor shall be maintained as described in Section 5.2.4 of the SAR. This SER provision shall be recognized as part of the RHWF safety basis, until such time that the SAR is updated. The SAR shall update Chapters 9 and 11 to reflect this Design Feature, and such changes shall be made no later than the next annual update of the SAR.

WVNS-SAR-023, Rev. 2 also includes an additional analysis of the Vitrification Cell Dismantlement Project waste containers as a waste stream to be processed through the RHWF. The addition of the Vitrification Cell waste did not impact the analysis in the SAR.

Technical Safety Requirements

The DOE Review team reviewed WVDP-146 in concert with the review of WVNS-SAR-001, Rev. 10 and WVNS-SAR-023, Rev. 2. The TSR Program described in WVDP-146 is consistent with the requirements in 10 CFR § 830.205 and the TSRs are appropriately derived from both WVNS-SAR-001, Rev. 10 and WVNS-SAR-023, Rev. 2

The Nuclear Regulatory Commission (NRC) had previously been involved in the review of both WVNS-SAR-001 and WVNS-SAR-023. The NRC previously reviewed these SARs to ensure that the activities at the WVDP were protective of the public for radiological hazards. These reviews are documented in the referenced NRC Safety Evaluation Reports (References 8.10 through 8.21). Since both WVNS-SAR-001, Rev. 10 and WVNS-SAR-023, Rev. 2 are annual updates of previously NRC-approved SARs, and the revised hazards analyzed are bounded by previously NRC-approved SARs, NRC did not review WVNS-SAR-001, Rev. 10 or WVNS-SAR-023, Rev. 2. Per discussions with the NRC staff, the NRC will assess the WVDP safety basis as part of NRC's ongoing monitoring visits.

In summary, the DOE reviews evaluated the radiological and non-radiological risks associated with operation of the facilities described in WVNS-SAR-001, Rev. 10, Draft B and WVNS-SAR-023, Rev. 2, Draft B. These reviews concluded that waste processing and support activities, including operation of the RHWF do not present a significant impact to the safety of on site workers, the public, or the environment.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this Safety Evaluation Report (SER) is to serve as the Department of Energy (DOE) approval document for WVNS-SAR-001, Rev. 10, Draft B, “Safety Analysis Report for Waste Processing and Support Activities” and WVNS-SAR-023, Revision 2, Draft B, “Safety Analysis Report for the Remote Handled Waste Facility,” at the West Valley Demonstration Project (WVDP).

This SER indicates that sufficient DOE and other agency reviews have been conducted and subsequently followed through on to achieve the necessary level of reliance with WVNS-SAR-001 and WVNS-SAR-023. This SER summarizes the aforementioned reviews and demonstrates that DOE has confidence in the safety basis described in WVNS-SAR-001, WVNS-SAR-023, and WVDP-146. Conditions for Approval were included Section 7, to include the results of the additional WVNSCO analysis of the hazard categorization of the WVDP. This additional analysis provides justification for DOE approval of WVNS-SAR-001, Rev. 10, Draft B.

West Valley Demonstration Project Department of Energy staff (DOE-OH/WVDP) reviewers and an independent reviewer reviewed WVNS-SAR-001 and WVNS-SAR-023 and played important roles in this subsequent approval. Staff from DOE-OH/WVDP formed the review team that reviewed WVNS-SAR-001 and WVNS-SAR-023, and prepared this Safety Evaluation Report (SER) for DOE-OH approval. A more detailed discussion of the review is provided in Section 2.

1.2 Background

1.2.1 Brief History of Site

The Western New York Nuclear Service Center (WNYNSC) in West Valley, New York, was the site of the first commercial nuclear reprocessing operation in the United States. It was operated by Nuclear Fuel Services, Inc. (NFS), beginning in the early 1960s and was discontinued in the early 1970s. The reprocessing operation resulted in the generation of approximately 600,000 gallons of high-level radioactive waste (HLW) that was stored in underground tanks.

The WVDP is located on approximately 200 acres within the 3,345-acre WNYNSC in rural Cattaraugus County, about 50 kilometers (30 miles) south of Buffalo, New York. The Project facilities include the former NFS plant and related facilities, some of which have been decontaminated and are currently in use by WVDP, other areas currently undergoing hazard reduction activities, and several buildings and facilities constructed by WVDP.

1.2.2 Brief Mission Recap

In 1980, Congress passed the West Valley Demonstration Project Act (Public Law 96-368) directing the U.S. Department of Energy to carry out a HLW management project to demonstrate solidification techniques for preparing the HLW at WNYNSC for disposal. Vitrification was determined to be the best demonstrated available technology for the treatment of HLW and was accordingly selected as the preferred technique.

The WVDP Act directs the Secretary of Energy to undertake five major activities, as follows:

- Solidify the liquid HLW stored at the WNYNSC into a form suitable for transportation and disposal.
- Develop containers for the solidified HLW suitable for permanent disposal of the HLW.
- Transport the waste to a federal repository for disposal.
- Dispose of low-level radioactive waste (LLW) and transuranic waste (TRU) produced by the Project.
- Decontaminate and decommission the HLW storage tanks, the HLW solidification facilities, and any material and hardware used in connection with the Project.

The first two activities have been completed, and 275 canisters of HLW are currently stored in the original processing plant in the former Chemical Process Cell. The Project is currently focused on the last two requirements since a federal repository for the HLW has yet to be opened. WVNS-SAR-001 and WVNS-SAR-023 collectively describe the facilities, activities and operations associated with completion of the final two requirements.

1.3 Hazard Classification of the WVDP Facilities

In accordance with 10 CFR 830.202(b)(3), the nuclear facilities at the WVDP have been categorized in accordance with DOE-STD-1027-92, Change 1, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports." Table 1 lists the nuclear facilities (Hazard Category 3 or higher) that are addressed in WVNS-SAR-001, Rev. 10, Draft B. Table 1 also lists the Remote Handled Waste Facility, which, as described in WVNS-SAR-023, Rev. 2, Draft B, is a Hazard Category 3 nonreactor nuclear facility.

TABLE 1

Nuclear Facilities (Hazard Category 3 or higher) Addressed in WVNS-SAR-001, Rev. 10, Draft B

Facility	Hazard Category
Main Plant	3
Supernatant Treatment System (STS)	3
Vitrification Facility	3
Fuel Receiving and Storage Facility	3
NRC-Licensed Disposal Area (NDA) ¹	< 3
Liquid Waste Treatment System (LWTS)	3
Chemical Process Cell - Waste Storage Area (CPC-WSA)	3
Lag Storage	3
Remote Handled Waste Facility ²	3

1. Based upon DOE-STD-1120-2005 guidance on “inactive waste sites.” See section 4.3
2. Remote Handled Waste Facility is described in WVNS-SAR-023, Rev. 2, Draft B

WVNS-SAR-001

The analysis presented in WVNS-SAR-001, Rev. 10, Draft B evaluated the hazards associated with waste processing and support activities in a manner consistent with the graded approach. The conclusions of the analysis indicated that only insignificant on-site and off-site consequences could result from abnormal or accident events, and, as stated in WVNS-SAR-001, the probability of occurrence of these events is unlikely or extremely unlikely. WVNS-SAR-001 appropriately discusses the design, the physical plant as constructed, and the policies and administrative controls that are in place to prevent or mitigate the risk to facility.

WVNS-SAR-023

The analysis presented in WVNS-SAR-023, Rev. 2, Draft B evaluated the hazards associated with the operation of the RHWF. The conclusions of the analysis indicated that only insignificant on-site and off-site consequences could result from abnormal or accident events, and the probability of occurrence of these events is unlikely or extremely unlikely. WVNS-SAR-023 appropriately discusses the design, the physical plant as constructed, and the policies and administrative controls that are in place to prevent or mitigate the risk to facility workers.

A further discussion of the major facility hazards and the dominant accident scenarios follows below.

1.4 Summary of Major Facility Hazards and Dominant Accident Scenarios

WVNS-SAR-001

No accident scenario analyzed in the SAR led to an off-site radiological or non-radiological release that challenged the Evaluation Guidelines (EGs) stated in DOE-STD-3009-94, Change Notice 2, "Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analysis." Therefore, waste processing operations and support activities at the WVDP do not present a threat to public health and safety. The postulated on-site radiological and non-radiological releases are minor. The health and safety of facility workers is primarily ensured through mature, DOE-approved programs such as the site's Integrated Safety Management System, the Radiation Protection Program, and the Emergency Preparedness Program.

Radiological Events

The Process Hazards Analyses (PHAs) are presented in Section 9 of WVNS-SAR-001. The PHAs indicate that the postulated radiological event having the greatest potential for a health-threatening consequence would be an energetic event involving a TRU waste drum in the Lag Storage Building (LSB). For this event, the maximum off-site dose (0.349 rem) is well below, and does not challenge, the radiological dose EG for the maximally exposed off-site individual (25 rem). The onsite unmitigated consequence has been conservatively calculated to be 18.8 rem at a distance of 100 meters. The DOE Review Team concludes that onsite dose consequences would still not be "significant." However, consequences to facility workers could be potentially high if credit was not given to non-combustible containers.

Nonradiological Events

The postulated non-radiological event with the most severe consequences is a catastrophic failure of one 1250 liter (330 gallon) tote of technical grade 35% hydrogen peroxide outside of the oxidizer room in the warehouse. The consequence for this event was determined to be moderate, meaning major impacts were limited to on-site personnel and environs. A ground-level concentration of 1.6 ppm was calculated at the 1050-m site boundary. This is below the off-site EG concentration value of 50 ppm (ERPG-2). The calculated on-site concentration at the 100-meter onsite evaluation point (OEP) was 54 ppm. This concentration was below the ERPG-3 value of 100 ppm. The DOE Review Team concluded that there was sufficient conservatism in the analysis such that this consequence would not be "significant." DOE also agrees that the previously evaluated uniform pool depth of 1 millimeter (1 mm) was unreasonably conservative.

Other chemicals are present and in use at the WVDP during waste processing operations; however, the postulated potential consequences are much less severe than those associated with a hydrogen peroxide spill. The frequency of occurrence of the postulated hydrogen peroxide spill was determined to be extremely unlikely, meaning that it has a potential frequency of occurrence in the range of 1E-04 to 1E-06 events per year. Therefore, from a risk management standpoint, the qualitative risk is low due to the extreme unlikelihood of an occurrence.

WVNS-SAR-023

As in WVNS-SAR-001, no accident scenario analyzed in the SAR led to an off-site radiological or non-radiological release that challenged the EG.

The Process Hazards Analyses (PHAs) are presented in Section 9 of WVNS-SAR-023. The PHAs indicate that the postulated radiological event having the greatest potential for a health-threatening consequence would be an explosion while processing waste stream 21. For this event, the maximum off-site dose (1.31 rem) is well below, and does not challenge the radiological dose EG for the maximally exposed off-site individual (25 rem). The onsite unmitigated consequence at the OEP (100 m) has been calculated to be 49.5 rem at a distance of 100 meters. The WVNSCO analysis was conservative in determining the potential consequence in that they used the material-at-risk (MAR) for waste stream 14 (CPC Dissolver Vessels), the highest activity waste stream, even though this accident is only credible for waste stream 21, an LLW waste stream. Based upon the conservatism used in determining the material-at-risk (MAR) and the actual waste form and type, and the guidance provided in Reference 8.30, the DOE Review Team concludes that onsite dose consequences would still not be “significant.” The DOE Review Team also concluded that the addition of the vitrification cell waste stream was bounded by the existing analysis in the SAR. The RWHF activities do not require the use of hazardous chemicals, therefore, nonradiological events did not need to be considered.

In summary, there were no identified significant on-site or off-site consequences resulting from radiological or non-radiological events. The occurrence of the most severe events is extremely unlikely or incredible. Specific Design Features and Administrative Controls that protect the facility worker are further described in Section 4.

2.0 REVIEW PROCESS

2.1 Purpose

This section of the SER briefly discusses and summarizes the thoroughness of the review process as related to WVNS-SAR-001, Rev 10, Draft B and WVNS-SAR-023, Rev. 2 and justifies DOE approval of the Safety Analysis Reports (SARs). This section does not provide a detailed record of individual comments received during the review process.

2.2 Review Participants

Key participants in the WVNS-SAR-001, Rev. 10 and WVNS-SAR-023, Rev. 2 review processes included staff from DOE-OH/WVDP and Atlas Consulting. The predecessor SARs to WVNS-SAR-001, Rev. 10 and WVNS-SAR-023, Rev. 2 were reviewed by teams consisting of one or more of the following organizations and the Nuclear Regulatory Commission:

1. Ohio Field Office (including DOE-OH/FEMP, DOE-OH/MEMP, and DOE-OH/WVDP)
2. Environmental Management (including the EM-323 Technical Review Group)
3. Idaho National Engineering and Environmental Laboratory
4. Lawrence Livermore National Laboratory
5. Strategic Management Inc. (SMI)

2.3 Basic Premise of Review

All comments received from reviewers were appropriately tracked through resolution. Verification of adequate resolution to all comments has been documented under a program that meets the requirements of DOE Order 414.1A. These records of comment resolution are maintained as Quality Assurance records.

The participants mentioned in Section 2.2 of this SER performed in-depth, detailed technical reviews of the changes to WVNS-SAR-001 and/or WVNS-SAR-023. A kickoff meetings was used to provide a general overview of the SARs and the associated facilities, and to provide expectations for the conduct of the review. The review was conducted in accordance with an approved review plan. Since all reviewers were familiar with the WVDP facilities, no orientation tour was given.

The scope of the reviews encompassed all facets of WVNS-SAR-001 and WVNS-SAR-023 including: site characteristics, principal design criteria, waste confinement and management, hazards protection, consequence assessment/accident analysis, conduct of operations and quality assurance. The criteria used to evaluate the SARs during this review included the following:

- 10 CFR 830, Nuclear Safety Management
- 10 CFR 830, Subpart A, Quality Assurance
- 10 CFR 830, Subpart B, Safety Basis Requirements
- 10 CFR 835, Occupational Radiation Protection
- DOE Order 232.1, Occurrence Reporting and Processing of Operations Information

DOE Order 414.1A, Quality Assurance
DOE Order 420.1A, Facility Safety
DOE Order 5480.19, Conduct of Operations Requirements for DOE Facilities
DOE Policy 450.4, Safety Management System
DOE-STD-1104-96, Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports
DOE-STD-3009-94, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports
DOE-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports
NRC Reg. Guide 3.26, Standard Format and Content of Safety Analysis Reports for Fuel Reprocessing Plants
29 CFR Part 1910, Occupational Safety and Health Standards

The Nuclear Regulatory Commission (NRC) had previously been involved in the review of both WVNS-SAR-001 and WVNS-SAR-023. The NRC previously reviewed these SARs to ensure that the activities at the WVDP were protective of the public for radiological hazards. These reviews are documented in the referenced NRC Safety Evaluation Reports (References 8.10 through 8.21). Since both WVNS-SAR-001, Rev. 10 and WVNS-SAR-023, Rev. 2 are annual updates of previously NRC-approved SARs, and the revised hazards analyzed were bounded by previously NRC-approved SARs, NRC did not review WVNS-SAR-001, Rev. 10 or WVNS-SAR-023, Rev. 2. Per discussions with the NRC staff, the NRC will assess the WVDP safety basis as part of NRC's ongoing site monitoring visits.

3.0 BASE INFORMATION

3.1 Purpose

The purpose of this section of the SER is to approve the adequacy of the SAR base information, including any conditions of approval imposed by reviewing agencies.

3.2 Adequacy Statement

The thoroughness and adequacy of WVNS-SAR-001 and WVNS-SAR-023 base information was ultimately verified and achieved through the review/comment and comment resolution phase of SAR development. The thoroughness of the SAR base information was verified by the detailed review by the DOE organizations listed in Section 2.2 of this SER. As described in Section 2, the DOE Review Team was selected to ensure an adequate mix of operations experience at the WVDP and specific expertise with regard to development and implementation of Safety Bases at other DOE sites.

The comments from all reviewers have been resolved. Comments were resolved by their incorporation into the SAR or by providing clarifying information to the reviewers. One comment resulted in the Conditions of Approval, as described in Section 4 and listed in Section 7.

3.3 Synopsis of Facilities and Operation Process Features

WVNS-SAR-001

WVNS-SAR-001 describes the facilities, activities and processes related to the West Valley Demonstration Project with the exception of the RHWF. Specifically, WVNS-SAR-001 focuses on the two primary radioactive material processes at WVDP and the associated support activities. The two primary processes are those associated with the Integrated Radwaste Treatment System (IRTS) and the Vitrification Facility. These primary processes have been completed, and WVDP is focused on the decontamination and deactivation of these systems. A Fuel Receiving and Storage (FRS) facility is also part of the original Main Plant facility and is empty and inoperative. Spent nuclear fuel (SNF) was removed from the FRS and placed in casks in 2001. In 2003, the SNF was shipped from the site, and the fuel pool was drained and decontaminated.

Liquid and solid low-level waste (LLW) treatment, processing, and storage facilities are also provided at the WVDP. Liquid LLW at the WVDP comprises contaminated waters resulting from area or equipment decontamination, treated solutions from the Liquid Waste Treatment System (LWTS), system flushwater, filter backwash, and laundry operations. These waste waters are treated using equipment located in the Low-Level Waste Treatment Replacement Facility (LLW2). Temporary storage of these liquid wastes is provided by four lagoon storage basins.

Interim (Lag) storage of solid LLW, hazardous waste, low-level mixed waste, and TRU and suspect TRU waste is provided in the Lag Storage Facilities, Hazardous Waste Storage Facility, Satellite Accumulation Areas, and the Interim Waste Storage Facility.

Solid waste at the WVDP is processed for volume reduction and off site shipment. Processing facilities include the Contact Size-Reduction Facility (CSRf), the Waste Reduction and Packaging Area (WRPA) compactor, the Container Sorting and Packaging Facility (CSPF), and the Lag Storage Area-4 (LSA-4) Shipping Depot Containment Area. The CSRf is located north of the Main Plant building and is connected to it. This area provides facilities for decontamination and size-reduction of bulk, contact-handled equipment, including failed process equipment and tanks and vessels removed during Main Plant decontamination activities. The WRPA compactor is located in the Main Plant building and is used for size-reduction of easily compressed solid LLW such as disposable anti-contamination clothing. The CSPF, a stand-alone facility located inside Lag Storage Area (LSA) -4, is used to sort, segregate, and repackage LLW, low-level mixed waste, TRU, and suspect TRU waste containers. The LSA Shipping Depot is attached to the south side of LSA-4 and is used to sort, repackage, size-reduce, and perform other activities necessary to prepare waste for shipment.

The Vitrification Facility (VF) consists of several associated structures, including the Transfer Trench, Vitrification Building, Cold Chemical Building, 01-14 Building, Transfer Tunnel, Load-In/Load-Out Area, Equipment Decontamination Room (EDR), High-Level Waste Interim Storage (HLWIS) area, Off-Gas Trench, and Diesel Fuel Oil Storage Tank Building. Vitrification operations were completed in 2002, and 275 HLW Canisters are currently stored in the HLWIS area.

WVNS-SAR-023

The RHWF is a free-standing facility that was designed and constructed to accommodate the waste streams from decontamination and deactivation activities at WVDP. The RHWF receives solid radioactive waste from other locations on the WVDP site and is used to visually inspect, sort, size reduce, segment, collect samples, and repackage this waste in a manner that meets current or expected disposal requirements.

The RHWF has nine areas that directly or indirectly support waste processing and repackaging operations. These are the Receiving Area, Buffer Cell, Work Cell, Contact Maintenance Area, Survey and Spot Decontamination Area, Radiation Protection Operations Area, Waste Packaging Area, Operating Aisle, and Load Out/Truck Bay. The RHWF also has four areas that contain systems or components that serve support functions, namely, the Exhaust Ventilation Filter Room, Exhaust Ventilation Blower Room, Mechanical Equipment Area (including the Stack Monitoring Room), and Office Area.

The Receiving Area provides weather protection for the loading and unloading of transfer vehicles. The Buffer Cell is a ventilation confinement boundary between the normally uncontaminated Receiving Area and the highly contaminated Work Cell. The Buffer Cell allows radiologically controlled movement of waste containers and other materials into the Work Cell with some shielding provided. The Work Cell is the primary work zone within the RHWF for fully remote handling, surveying, size reducing, segmenting, decontaminating, and/or repackaging operations. The Waste Packaging Area provides a confined and shielded space for transferring filled waste drum liners and box liners out of the Work Cell via the Waste Transfer System. The Survey and Spot Decontamination Area, located just beyond the Waste Packaging Area, provides space for decontaminating and/or overpacking containers. The Load Out/Truck Bay is a weather-enclosed structure to support loading of filled waste containers onto transport vehicles and transfer of empty waste containers into the facility.

4.0 HAZARD AND ACCIDENT ANALYSES

4.1 Purpose

The purpose of this section of the SER is to document the DOE approval of the SARs' hazard and accident analyses, including describing any conditions of approval imposed. No attempt will be made to reproduce the hazards analyses stated in Section 9 of the SARs.

Since DOE-STD-3009 is used as the “safe harbor” approach for both WVNS-SAR-001 and WVNS-SAR-023, this standard serves as the primary review criteria. Overall, the DOE Review Team gave consideration to the following elements to judge the adequacy of the hazard and accident analyses:

- Are radioactive and chemical hazards contained within the facility identified and addressed in the hazard analysis?
- Has the facility been properly categorized consistent with DOE-STD-1027-92?
- Was a full spectrum of accidents evaluated based on the scope of proposed work activities, including external man-made hazards, and natural phenomena events?
- Have operational controls been selected commensurate with the level of hazard, consequences, and effectiveness in controlling the hazards?

4.2 Hazard Identification

WVNS-SAR-001

Various sections of the SAR describe the sources of remaining hazards within numerous facility areas covered by the SAR. Section 9.1.2.1 provides a general acknowledgement of low inherent operational energy sources associated with waste management and decontamination and decommissioning activities. Section 7 describes various waste types and compositions, and Section 8 provides radionuclide composition that supports various MAR assumptions used in the hazard and accident analysis.

The DOE Review Team concluded that hazard identification is sufficient to support the hazard and accident analysis.

WVNS-SAR-023

Section 9.1.2.1 of the SAR presents a general summary of hazards, and Section 8.2 provides a specific description of waste streams proposed for processing. The form and volume of each waste stream is presented, as well as radioactive/hazardous constituents. The SAR also discusses the facility location of wastes during various phases of processing.

It is noted that not all waste streams described in the SAR will be located in the facility at the same time. Waste streams 12 through 16 are presented as the bounding material-at-risk (MAR) that is used in the hazard and accident analysis. These waste streams include components and debris that were generated as a result of the disassembly and removal of various components from the Chemical Process Cell. The radiological composition of these waste streams is

presented in the SAR Table 8.2-1 and is expected to have a radionuclide distribution similar to spent nuclear fuel.

Available energy sources are generally described in Chapter 9 and include mechanical insults, moving vehicles and associated petroleum-based fuel, and hydrogen sources from some wastes. Facility process descriptions provided in Chapter 5 support a basic understanding of these energy sources that could impact radiological/hazardous materials.

The DOE Review Team concluded that hazards are identified in Chapters 5, 8 and 9 in a manner that is sufficient to support the hazard analysis process.

4.3 Hazard Categorization

WVNS-SAR-001

The hazard categorization was originally provided in Section 1.5 of the SAR. This hazard categorization was based upon the total inventory in a given facility and the consequence of an unmitigated release. Based upon comments from the DOE Review Team, WVNSCO re-assessed the hazard categorization of a number of facilities based upon the guidance in DOE-STD-1027-92. Specifically, WVNSCO used guidance on segmentation, adjusted facility inventory, and inactive waste sites (from DOE-STD-3009-94 and DOE-STD-1120-2005) to justify the recategorization of a number of facilities. DOE conducted a separate review of this analysis which is provided in Attachment A.

In addition, as stated in WVNS-SAR-001, WVNSCO intended to recategorize the entire WVDP as a Hazard Category 3 nuclear facility, with no further segmentation into individual facilities for the purpose of hazard categorization. DOE evaluated this approach and has concluded, at this time, it is inappropriate to categorize the WVDP, in its entirety, as a Hazard Category 3 nuclear facility. As such, DOE agrees to the following hazard categorization.

Facility	Hazard Category
Main Plant	3
Supernatant Treatment System (STS)	3
Vitrification Facility	3
Fuel Receiving and Storage Facility	3
NRC-Licensed Disposal Area (NDA) ¹	< 3
Liquid Waste Treatment System (LWTS)	3
Chemical Process Cell - Waste Storage Area (CPC-WSA)	3
Lag Storage	3
Remote Handled Waste Facility ²	3

1. Base upon DOE-STD-1120-2005 guidance on “inactive waste sites.”
2. Remote Handled Waste Facility is described in WVNS-SAR-023, Rev. 2, Draft B

WVNS-SAR-023

Hazard categorization results are presented in Section 9.1.2.2 and discussed in Section 1.5. The RHWF is a Hazard Category 3 nuclear facility based on MAR estimates presented in Table 8.2-1. MAR quantities exceed Hazard Category 3 threshold quantities, but are below Hazard Category 2. While the assumed inventory does not include all waste streams to be processed in the facility, the DOE Review Team concluded that it provided a bounding representation of MAR that would be expected in the facility at any one time. DOE confirmed that a sum of the ratios of each radionuclide to DOE-STD-1027 threshold quantities (HC2) is less than one. Therefore, a designation of Hazard Category 3 is supported.

4.4 Hazard and Accident Analysis

WVNS-SAR-001

A description of the hazard evaluation methodology is presented in Section 9.1.1 of the SAR. The overall approach used to classify accident consequences and frequencies is consistent with example methods discussed in DOE-STD-3009-94, including the use of risk factors as input to accident selection.

The largest on-site consequence, as presented in Tables 9.2-3 through 9.2-6, was associated with an energetic event involving a TRU/suspect TRU waste drum in the Lag Storage Building. For this event, the maximum off-site dose (0.349 rem) is well below, and does not challenge, the radiological dose EG for the maximally exposed off-site individual (25 rem). The onsite unmitigated consequence was conservatively calculated to be 18.8 rem at the OEP (at a distance of 100 meters). The DOE Review Team concludes that onsite dose consequences would still not be “significant” based on risk binning guidelines currently endorsed by the Office of Environmental Management (Reference 8.30), but consequences to a facility worker could be potentially high if credit is not given to non-combustible containers. DOE agrees with the selection of the Technical Safety Requirements (TSRs) specified for the TRU/suspect TRU packages.

The DOE Review Team noted that the approach used by WVNSCO for the hazard analysis associated with the potential fire involving a TRU or suspect TRU drum differs from the approach used at Hanford, Idaho and Rocky Flats. While different, the DOE Review Team has concluded that the accident analysis of an energetic event involving a single TRU waste drum is reasonably bounding for an accident involving TRU waste at the WVDP. The DOE Review Team recognized that TSR Administrative Controls have been established to ensure worker safety in association with TRU wastes. In addition, the DOE Review Team acknowledged that sufficient conservatism exists to satisfactorily offset any potential nonconservative assumptions in the source term, in particular the material at risk and ARF x RF value used in the WVNSCO analysis.

The results of the hazard evaluation and accident analysis presented in Chapter 9 encompass a representative set of accidents that could impact workers and the public. The Process Hazard Analysis (PHA) provides a systematic evaluation of accidents for each area of the facility where the MAR could be present. A bounding and representative set of accidents are further analyzed to evaluate onsite and offsite consequences. Source terms are calculated using release fractions provided in DOE-HDBK-3010-94.

WVNS-SAR-023

The hazard evaluation methodology is identical to that described above for WVNS-SAR-001. The largest on-site consequence, as presented in Tables 9.2-3 through 9.2-6, was associated with an explosion while processing waste stream 21. For this event, the maximum off-site dose (1.31 rem) is well below, and does not challenge, the radiological dose EG for the maximally exposed off-site individual (25 rem). The onsite unmitigated consequence at the OEP (100 m) has been

calculated to be 49.5 rem at a distance of 100 meters. Therefore, the DOE Review Team concludes that onsite dose consequences would still not be “significant” based on risk binning guidelines currently endorsed by the Office of Environmental Management (Reference 8.30). It also noted that source terms estimated for this accident are conservatively estimated.

The DOE Review Team also concluded that the addition of the vitrification cell waste stream was bounded by the existing analysis in the SAR. The RWHF activities do not require the use of hazardous chemicals, therefore, nonradiological events did not need to be considered.

The results of the hazard evaluation and accident analysis presented in Chapter 9 encompass a representative set of accidents that could impact workers and the public. The Process Hazards Analysis (PHA) provides a systematic evaluation of accidents for each area of the facility where the MAR could be present. A representative set of accidents are further analyzed to evaluate onsite and offsite consequences. Source terms are calculated using release fractions provided in DOE-HDBK-3010-94 and are considered more than sufficient for a Hazard Category 3 facility.

5.0 SAFETY STRUCTURES, SYSTEMS, AND COMPONENTS (SSCs)

The purpose of this section of the SER is to evaluate the basis related to designation of safety class or safety significant SSCs within both WVNS-SAR-001 and WVNS-SAR-023.

WVNS-SAR-001

There are no evaluation basis accidents (EBAs) analyzed in WVNS-SAR-001 that have unmitigated consequences that challenge the EG of DOE-STD-3009. Therefore, no active or passive Safety Class SSCs were proposed for the group of facilities covered by WVNS-SAR-001. This position is supported by the hazard and accident analysis, which recognizes that the available MAR is not readily dispersible.

For the purposes of criticality control, fissile content administrative limits for TRU waste containers containing greater than 1 gram of fissile material exist. In addition, "approved containers" for TRU and suspect TRU waste are cited as "design features" in WDP-146. "Approved containers" provide an important confinement function and support minimizing the propagation of fire. WVNS-SAR-001, Rev. 10, Draft B, states that the "approved containers" must satisfy the following requirements for the intended function:

- Fabricated from non-combustible material (carbon steel, stainless steel, galvanized steel, etc.);
- Lid, in place, with all bolts, snap rings or clips in place; and
- Procured per an approved Quality Assurance program.

WVNS-SAR-023

There are no design basis accidents (DBAs) analyzed in WVNS-SAR-023 that have unmitigated consequences that challenge the EG of DOE-STD-3009. Therefore, no active or passive Safety Class SSCs were proposed for the RHWF. This is consistent with the designation of a Hazard Category 3 facility, which by definition has the potential for localized consequences only.

The materials of construction and dimensions of the RHWF Work Cell walls, floor, and roof are cited as "design features" in WDP-146, *West Valley Demonstration Project Technical Safety Requirements*. WVNS-SAR-023, Rev.2, Draft B states that the materials of construction and dimensions of the RHWF Work Cell walls, floor, and roof shall be maintained as described in the SAR. The noted features of the Work Cell are considered to be important for worker protection in the event of an explosion accident.

6.0 TECHNICAL SAFETY REQUIREMENTS (TSRs)

6.1 Purpose

The purpose of this section of the SER is to document the DOE review and approval basis for the derivation of TSR controls as established in WVNS-SAR-001 and WVNS-SAR-023. The section also provides the basis for TSR provisions as contained in WVDP-146. The basis for the DOE review included DOE-STD-3009 expectations for control derivation, TSR requirements of 10 CFR 830.205, and acceptable TSR practices described in DOE G 423.1-1

6.2 Derivation of TSR Controls

WVNS-SAR-001

Derivation of TSR controls is described in Chapter 11 of the SAR. The SAR recognizes Administrative Controls (AC) for TSR coverage that includes a commitment to Safety Management Programs. In addition, the SAR acknowledges that the TRU waste containers containing greater than one (1) gram fissile material will be protected as a TSR Design Feature. The SAR describes “approved containers” as follows:

“Approved containers” are containers that satisfy the following requirements: 1) are fabricated from a non-combustible material such as carbon steel, stainless steel, or galvanized steel; 2) have a lid in place with all bolts, snap rings, clips, or other fastening devices in place; and 3) have been procured per an approved Quality Assurance program. “Approved containers” include 55 gallon steel drums, standard waste boxes (per Waste Isolation Pilot Plant [WIPP] Specification E-I-343, latest revision), ten drum overpacks (per WIPP Specification E-I-430, latest revision), Department of Transportation (DOT) strong tight containers, and DOT Type 7A packages. The WVNSCO Radiation and Safety Committee (R&SC) may also approve other “special containers” as “approved containers” so long as they satisfy the above described requirements.

These features are important for worker protection following an energetic event involving TRU waste in the LSB as identified in Chapter 9. Containment of TRU waste containing greater than (1) gram of fissile material in an "Approved Container" significantly reduces the potential for fire propagation and limits the amount of alpha-emitting activity available for release during a fire in the Lag Storage Facility.

WVNS-SAR-023

Derivation of TSR controls is described in Chapter 11 of the SAR. The SAR recognizes Administrative Controls (AC) for TSR coverage that includes a commitment to Safety Management Programs. The SAR also has an explicit AC that ensures that processing of waste streams other than those identified in the SAR must be evaluated in accordance with the USQ process. This AC maintains the facility in a Hazard Category 3 status, based on the waste streams proposed for processing.

The SAR acknowledges the RHWF work cell structure as a TSR “design feature.” Specifically, the SAR states the following:

The materials of construction and dimensions of the RHWF Work Cell walls, floor, and roof shall be maintained as described in Section 5.2.4 of this SAR. Specifically, the Work Cell walls, floor, and roof shall be constructed of reinforced concrete, and the Work Cell wall thickness shall be approximately 0.76 meters (2.5 ft), while the roof thickness shall be approximately 0.30 meters (1.0 ft). The floor and the lower portion of the Work Cell walls shall be lined with stainless steel. However, penetrations that do not impact the structural integrity of the Work Cell may be made through the walls, floor, and roof as necessary to support operations within the Work Cell. The noted features of the Work Cell are considered to be important for worker protection in the event of an explosion accident.

6.3 Provisions of Technical Safety Requirements

The DOE review focused on TSR provisions provided in WVDP-146 (Reference 8.9), which are applicable to facilities covered by both WVNS-SAR-001 and WVNS-SAR-023.

The DOE Review Team agrees that no safety limits, limiting control settings or limiting conditions for operation are necessary based on the results of hazard and accident analyses. The TSR does not contain these provisions. The DOE review focused primarily on other provisions of the TSR. The other provisions of the TSRs addressed the “Conditions of Approval” described in WVDP-SER-001, Rev. 2. The incorporation of the “Conditions of Approval” from WVDP-SER-001, Rev. 2, was found to be acceptable.

7.0 CONDITIONS OF APPROVAL

The following conditions of approval shall be implemented in accordance with all stated provisions described below:

- 1) DOE has concluded that it is inappropriate to categorize the WVDP, in its entirety, as a Hazard Category 3 nuclear facility. As such, DOE agrees to the following hazard categorization.

Facility	Hazard Category
Main Plant	3
Supernatant Treatment System (STS)	3
Vitrification Facility	3
Fuel Receiving and Storage Facility	3
NRC-Licensed Disposal Area (NDA) ¹	< 3
Liquid Waste Treatment System (LWTS)	3
Chemical Process Cell - Waste Storage Area (CPC-WSA)	3
Lag Storage	3
Remote Handled Waste Facility	3

1. Base upon DOE-STD-1120-2005 guidance on “inactive waste sites.”

These hazard categorizations shall be incorporated into the next revision of WVNS-SAR-001 (unless inventory changes justify other categorization).

- 2) The analysis provided in Reference 8.31, Enclosure 3, “Final Hazard Categorization of WVDP Facilities Previously Categorized as Hazard Category 2,” shall be incorporated into the next revision of WVNS-SAR-001 (unless inventory changes justify other categorization). Until such time, Enclosure 3 shall be considered as an attachment to WVDP-SAR-001 and incorporated by reference.
- 3) Author commitments specified in Reference 8.31, Enclosure 1, “Document Record Review” shall be incorporated into the next revision of WVNS-SAR-001.

8.0 REFERENCES

- 8.1 WVNS-SAR-001, Safety Analysis Report for Project Overview and General Information, Revisions 2 through 8, West Valley Nuclear Services Company, various dates.
- 8.2 WVNS-SAR-002, Safety Analysis Report for Low-Level Waste Processing and Support Activities, Revisions 3 through 8, West Valley Nuclear Services Company, various dates.
- 8.3 WVNS-SAR-002, Addendum 4, Safety Analysis Report Addendum for Head End Cell Decontamination and Waste Packaging, Revision 0, West Valley Nuclear Services Company, March 1, 2002.
- 8.4 WVNS-SAR-003, Safety Analysis Report for Vitrification Operations and High-Level Waste Interim Storage, Revisions 0 through 7, West Valley Nuclear Services Company, various dates.
- 8.5 WVNS-SAR-012, Safety Analysis Report for Fuel Receiving and Storage Facility, Revisions 0 through 3, West Valley Nuclear Services Company, various dates.
- 8.6 WVDP-SER-001, Safety Evaluation Report for Project Overview and General Information, Revision 1, September 2002.
- 8.7 WVDP-SER-001, Safety Evaluation Report for Waste Processing and Support Activities and the Remote Handled Waste Facility, Revision 2, dated February 2004
- 8.8 WVDP-SER-023, Safety Evaluation Report for Remote Handled Waste Facility, Revision 1, September 2000.
- 8.9 WVDP-146, West Valley Demonstration Project Technical Safety Requirements, Rev. 3
- 8.10 NRC Staff Safety Evaluation Report on the Dormant West Valley Reprocessing Facility, U. S. Nuclear Regulatory Commission, January 1982.
- 8.11 Safety Evaluation Report on the West Valley Demonstration Project Cement Solidification System, U. S. Nuclear Regulatory Commission, August 1987.
- 8.12 Safety Evaluation Report on the West Valley Demonstration Project Supernatant Treatment System, A Review of Safety Analysis Report, Volume III, Part D (WVNS SAR-004 Rev. 6), U. S. Nuclear Regulatory Commission, December 1991.
- 8.13 Safety Evaluation Report on the West Valley Demonstration Project Liquid Waste Treatment System, U. S. Nuclear Regulatory Commission, April 1988.
- 8.14 Safety Evaluation Report on the West Valley Demonstration Project Low-Level Waste Drum Cell, U. S. Nuclear Regulatory Commission, January 1989.

- 8.15 Safety Evaluation Report on the West Valley Demonstration Project, Supernatant Treatment System, U. S. Nuclear Regulatory Commission, September 1987.
- 8.16 Letter, G. C. Comfort, Jr., to T. J. Rowland, "NRC Review of Safety Analysis Report for Project Overview and General Information, WVNS-SAR-001, Revision 2, Draft G," dated July 26, 1996.
- 8.17 Letter, G. C. Comfort, Jr., to T. J. Rowland, "NRC Review of Safety Analysis Report for Low-Level Waste Processing and Support Activities, WVNS-SAR-002, Revision 3," dated September 13, 1995.
- 8.18 Letter, L. W. Camper to A. C. Williams, "U.S. Nuclear Regulatory Commission Safety Evaluation Report of WVNS-SAR-002, Safety Analysis Report for Low-Level Waste Processing and Support Activities," dated October 26, 2001.
- 8.19 Safety Evaluation Report on the West Valley Demonstration Project Vitrification Process and High-Level Waste Interim Storage, A Review of WVNS-SAR-003, Revision 2, Draft D, U.S. Nuclear Regulatory Commission, May 1995.
- 8.20 Letter 1760:95:09, G. C. Comfort to T. J. Rowland, "NRC Review of Safety Analysis Report for Fuel Receiving and Storage Facility, WVNS-SAR-012, Revision 0, Draft C," dated February 19, 1997.
- 8.21 Letter, D. M. Gillen to T. J. Jackson, "U.S. Nuclear Regulatory Commission Safety Evaluation Report on the West valley Demonstration Project Safety Analysis Report for the Remote-Handled Waste Facility (WVNS-SAR-023, Rev. 1, Draft D)," dated November 7, 2003.
- 8.22 DOE-STD-1027-92, Change 1, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," September, 1997.
- 8.23 DOE-STD-3009-94, Preparation Guide for US. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports.
- 8.24 DOE-HDBK-3010-94, Airborne Release Fractions/Rates And Respirable Fractions For Nonreactor Nuclear Facilities.
- 8.25 West Valley Demonstration Project Act (Public Law 96-368).
- 8.26 DOE O 414.1A, Quality Assurance.
- 8.27 10 CFR 830, Subpart A, Quality Assurance Requirements.
- 8.28 10 CFR 830, Subpart B, Safety Basis Requirements.
- 8.29 DOE Order 5480.19, Conduct of Operations Requirements for DOE Facilities.

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- 8.30 Memorandum, R. Nelson to Jorge Ferrer, et al., “Nuclear Safety Risk Ranking and Control Selection Guidelines,” dated February 7, 2003
- 8.31 Letter, L. J. Chilson to J. H. Swailes, “West Valley Nuclear Services Company Responses to the Department of Energy Comments on WVNS-SAR-001, Rev. 10, Draft B and WVNS-SAR-023, Rev. 2, Draft B,” dated September 7, 2005

Attachment A

**Review of
Final Hazard Categorization of WVDP Facilities
Previously Categorized as Hazard Category 2**

PURPOSE

The purpose of this review was to evaluate the re-categorization of nuclear facilities at the West Valley Demonstration Project. The intent of the review was to compare the Hazard Categorization of specific facilities at WVDP to the criteria specified in DOE-STD-1027-92.

RESULTS

The review concludes:

1. The recategorization of the Main Plant Process Building, Supernatant Treatment System, Vitrification Facility, and Fuel Receiving and Storage Facility to Hazard Category 3 is reasonable.
2. Classification of the NRC-Licensed Disposal Area as an “inactive waste site” and therefore recategorized as “less than Hazard Category 3” is reasonable.

DISCUSSION

On September 7, 2005, West Valley Nuclear Service Company provided a response to Department of Energy comments on WVNS-SAR-001, Rev. 10, Draft B. As part of this response, WVNSCO provided a re-assessment of the hazard categorization of the Main Plant Process Building, Supernatant Treatment System, Vitrification Facility, Fuel Receiving and Storage Facility, and the NRC-Licensed Disposal. The intent of the reassessment was to recategorize these facilities to Hazard Category 3.

Main Plant Process Building

Application of the Hazard Classification Decision Process in Section 3 of DOE-STD-1027-92 would result in the MPPB being classified as HC-2. Using the guidance in DOE-STD-1027-92, WVNSCO segmented the MPPB into three major areas: 1) the Head End Cells; 2) the Extraction and Purification Areas; and 3) the Support Areas. In addition, WVNSCO modified the HC-2 threshold quantities (TQs) based upon more appropriate release fraction. In order for DOE to approve this recategorization, three items needed to be evaluated.

1. Did WVNSCO appropriately segment the MPPB into three major areas (the Head End Cells, the Extraction and Purification Areas, and the Support Areas)?
2. Is the application of “adjusted facility inventory” acceptable? and if so,
3. Did WVNSCO select reasonable releases fraction for the adjusted facility inventories?

Facility Segmentation

DOE-STD-1027-92 permit the used of facility segmentation for hazard categorization.

From DOE-STD-1027-92:

In facility categorization, flexibility must be allowed in the definition of facility segments. Many DOE facilities conduct a wide variety of activities in one facility, ranging from simple assay or lab experiments to complex fluid flow separations. It is necessary to avoid placing excessive requirements on simple or even trivial co-located operations. The concept of independent facility segments should be applied where facility features preclude bringing material together or causing harmful interaction from a common severe phenomenon.

It should be noted that DOE 5480.23 states that an analysis and categorization is to be performed on “processes, operations, or activities” and not necessarily whole facilities. For the purposes of hazard categorization and estimating hazardous material inventory, the objective is to understand the available hazards that could interact and cause harm to individuals or the environment. It is not desirable to estimate the potential consequences from an inventory of hazardous materials when facility features would preclude bringing this material together. Therefore, the standard permits the concept of facility segmentation provided the hazardous material in one segment could not interact with hazardous materials in other segments. For example, independence of HVAC and piping must exist in order to demonstrate independence for facility segmentation purposes. This independence must be demonstrated and places the “burden of proof” on the analyst.

The hazard categorization provided by WVNSCO addressed, in detail, the facility segmentation. The analysis demonstrated the isolation of ventilation systems, the inability of contamination to spread among major areas, and the inability of fire to potentially propagate from one segment to another. The analysis also evaluated the potential for the co-mingling of activities in segmented areas as the result of seismic events. The analysis concluded that there was no single-credible event with sufficient energy to cause co-mingling of activities from the segmented areas.

Based upon this information, segmenting the MPPB into three major areas is reasonable and appropriate.

Adjusted Facility Inventory

Radionuclide limits for Hazard Category 2 nuclear facilities provided in Appendix A of DOE-STD-1027-92 were derived assuming a release fraction (ARF x RF) of 1E-3. This generic release fraction, while bounding for a wide variety of potential release scenarios, is overly conservative for the sources and nature of contamination remaining in the MPPB. DOE-STD-1027-92 permits the use of an alternative set of limits based on alternative release fractions for those cases where it can be shown that the potential for release from a facility is significantly less than that assumed in the Standard. From DOE-STD-1027-92

The Hazards Analysis (or other existing safety analyses) provides an understanding of the material which can physically be released from the facility. This inventory should be compared against the Threshold Quantities (TQs) identified in Attachment 1. The airborne release fractions used in generating the TQ values for Category 2 in Table A.1 are provided on Page A-9 of Attachment 1. As discussed in the attachment, these are intended to be generally conservative for a broad range of possible situations. Therefore, the inventory values of Table A.1 may be used directly for determination as to whether a facility exceeds Category 2. Alternatively, for final Categorization, for facilities initially classified as Hazard Category 2, if the credible release fractions can be shown to be significantly different than these values based on physical and chemical form and available dispersive energy sources, the threshold inventory values for Category 2 in Table A.1 may be divided by the ratio of the maximum potential release fraction to that found on Page A-9. All assumptions which are used to reduce the inventory at risk should be supported in the Hazards Analysis. This

also applies to ground rules identified in Attachment 1, to demonstrate that the ground rule conditions exist.

WVNSCO performed an analysis for each of the areas within the MPPB that currently contain radionuclide inventories that approach the Hazard Category 2 limit threshold. The application of adjusted facility inventory was acceptable for this analysis.

Release Fractions

Radionuclide limits for Hazard Category 2 nuclear facilities provided in Appendix A of DOE-STD-

1027-92 were derived assuming a release fraction (ARF x RF) of 1E-3. To adjust the inventory values, WVNSCO must justify a credible release fraction to be used in lieu of the value used in DOE-STD-1027-92. In the case of MPPB recategorization, WVNSCO used the following values.

MAIN PLANT PROCESS BUILDING AREA RELEASE FRACTION		
MPPB Area	Release Fraction (ARF X RF)	Justification
PMC	6E-5	Thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces
GPC	6E-5	Thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces
CPC		
• Cell Surfaces/VEM	6E-5	Thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces
• Floor Debris/HiVac Cans HEC Wastes in HLWIS	6E-6	Reduction of release fraction of “thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces” to account for the material at risk being inside a container
• HLW Canisters in HLWIS	7.56E-08	WVNS-SAR-001, Rev. 9, Draft B, Section 9.2.4.3
XC1	1E-4	Free-fall spill of solution
XC2	6E-5	Thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces
XC3	1E-4	Free-fall spill of solution
PPC	6E-5	Thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces
ARC	6E-5	Thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces
OGC	6E-5	Thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces
LWC	1E-4	Free-fall spill of solution

Based upon review of justification provided in the WVNSCO analysis, the values selected by WVNSCO appear to be reasonable.

Supernatant Treatment System

Application of the Hazard Classification Decision Process in Section 3 of DOE-STD-1027-92 would result in the Supernatant Treatment System (STS) being classified as HC-2. Using the guidance in DOE-STD-1027-92, WVNSCO modified the HC-2 threshold quantities (TQs) based upon more appropriate release fraction. In order for DOE to approve this recategorization, two items needed to be evaluated.

1. Is the application of “adjusted facility inventory” acceptable? and if so,
2. Did WVNSCO select reasonable releases fraction for the adjusted facility inventories?

Adjusted Facility Inventory

As stated above, radionuclide limits for Hazard Category 2 nuclear facilities provided in Appendix A of DOE-STD- 1027-92 were derived assuming a release fraction (ARF x RF) of $1\text{E-}3$. This generic release fraction is overly conservative for the sources and nature of contamination remaining in the STS. DOE-STD-1027-92 permits the use of an alternative set of limits based on alternative release fractions for those cases where it can be shown that the potential for release from a facility is significantly less than that assumed in the Standard. WVNSCO performed an analysis for the remaining inventory in the STS. The application of adjusted facility inventory was acceptable for this analysis.

Release Fractions

Radionuclide limits for Hazard Category 2 nuclear facilities provided in Appendix A of DOE-STD-1027-92 were derived assuming a release fraction (ARF x RF) of $1\text{E-}3$. To adjust the inventory values, WVNSCO must justify a credible release fraction to be used in lieu of the value used in DOE-STD-1027-92. In the case of STS recategorization, WVNSCO used a value of $\text{ARF} \times \text{RF} = 1\text{E-}4$. The value of $1\text{E-}4$ was derived from the DOE-STD-3010-94 for a free-fall spill of a liquid. It should be noted that WVNSCO chose a highly conservative $\text{ARF} \times \text{RF}$. For example, since a significant amount of the activity exists as a fixed contamination of the surface (i.e., bathtub ring), an $\text{ARF} \times \text{RF}$ of $6\text{E-}5$ could have been used for those long-lived radionuclides. In addition, a significant amount of the activity also exists as spent resin and slurry, an $\text{ARF} \times \text{RF}$ of $4\text{E-}5$ would have been appropriate in this case. In summary, the selection of $1\text{E-}4$ for the $\text{ARF} \times \text{RF}$ for STS is appropriate.

Vitrification Facility

Application of the Hazard Classification Decision Process in Section 3 of DOE-STD-1027-92 would result in the Vitrification Facility being classified as HC-2. Using the guidance in DOE-STD-1027-92, WVNSCO modified the HC-2 threshold quantities (TQs) based upon more appropriate release fraction. In order for DOE to approve this recategorization, two items needed to be evaluated.

3. Is the application of “adjusted facility inventory” acceptable? and if so,
4. Did WVNSCO select reasonable releases fraction for the adjusted facility inventories?

Adjusted Facility Inventory

As stated above, radionuclide limits for Hazard Category 2 nuclear facilities provided in Appendix A of DOE-STD- 1027-92 were derived assuming a release fraction (ARF x RF) of $1\text{E-}3$. This generic release fraction is overly conservative for the sources and nature of contamination remaining in the Vitrification Facility. DOE-STD-1027-92 permits the use of an alternative set of limits based on alternative release fractions for those cases where it can be shown that the potential for release from a facility is significantly less than that assumed in the Standard. WVNSCO performed an analysis for the remaining inventory in the Vitrification Facility. The application of adjusted facility inventory was acceptable for this analysis.

Release Fractions

Radionuclide limits for Hazard Category 2 nuclear facilities provided in Appendix A of DOE-STD-

1027-92 were derived assuming a release fraction (ARF x RF) of $1\text{E-}3$. To adjust the inventory values, WVNSCO must justify a credible release fraction to be used in lieu of the value used in DOE-STD-1027-92. In the case of Vitrification Facility recategorization, WVNSCO used a value of $\text{ARF} \times \text{RF} = 6\text{E-}5$. This value (which is based upon the thermal stress of surface-contaminated, solid, noncombustible, unyielding surfaces) is reasonable for fixed contamination on cell surfaces.

Fuel Receiving and Storage Facility

The Fuel Receiving and Storage Facility is a Hazard Category 3 facility based upon direct comparison with the values provided in DOE-STD-1027-92, Appendix A.

NRC-Licensed Disposal Area

The DOE EM program office provided guidance for categorizing these inactive waste sites in the September, 2002 Memorandum, *Hazard Categorization of EM Inactive Waste Sites as Less Than Category 3*, Jessie Hill Roberson to Distribution, September 17, 2002. Analyses that identified key assumptions and considerations that provided the basis for the downgraded categorization of these sites were included in the guidance. This guidance was subsequently incorporated into DOE-STD-1120-2005. The guidance was based on results of generic hazard analysis and supporting categorization used to downgrade inactive waste sites throughout the DOE complex. When specific criteria are satisfied, an inactive waste site may be downgraded below Hazard Category 3 and, therefore, not subject to the requirements of 10 CFR 830, Subpart B. The categorization (below Category 3) remains valid as long as the key assumptions and considerations remain valid.

The analysis provided by WVNSCO compared the NRC-Licensed Disposal Area (NDA) to the generic inactive waste site used in DOE-STD-1120-2005. WVNSCO did a direct comparison between the hazards analysis used in DOE-STD-1120-2005 generic inactive waste site and a similar hazards analysis performed on the NDA. Based upon this analysis, recategorization of the NDA to “less than Hazard Category 3” is appropriate.

CONCLUSION

Based upon the above discussion, the following conclusions were reached:

MPPB

- The segmentation of the Main Plant Process Building (MPPB) into three major areas (the Head End Cells, the Extraction and Purification Areas, and the Support Areas) is consistent with the guidance in DOE-STD-1027-92.
- The application of adjusted facility inventory is acceptable, and the selection of revised release fractions is appropriate.

STS

- The application of adjusted facility inventory is acceptable, and the selection of revised release fractions is appropriate.

Vitrification Facility

- The application of adjusted facility inventory is acceptable, and the selection of revised release fractions is appropriate.

FRS

- The FRS is Hazard Category 3 based upon direct comparison to Appendix A of DOE-STD-1027-92.

NDA

- The designation of the NDA as an “inactive waste site” is appropriate. As such, the NDA would be “less than Hazard Category 3.”

Therefore, the recategorization of the Main Plant Process Building, Supernatant Treatment System, Vitrification Facility, and Fuel Receiving and Storage Facility to Hazard Category 3 is reasonable. Recategorization of the NDA to “less than Hazard Category 3” is reasonable.

REFERENCES

1. 10 CFR 830, Subpart B, *Safety Basis Requirements*
2. DOE G 421.1-2, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830*
3. DOE-STD-1027-92, Change 1, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*
4. DOE-STD-1120-2005, *Integration of Environment, Safety, and Health into Facility Disposition Activities*
5. DOE-STD-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities, Volume 1 - Analysis of Experimental Data*, December 1994

DOCUMENTS REVIEWED

Letter, L. J. Chilson to J. H. Swailes, "West Valley Nuclear Services Company Responses to the Department of Energy Comments on WVNS-SAR-001, Rev. 10, Draft B and WVNS-SAR-023, Rev. 2, Draft B," dated September 7, 2005